

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listing, of claims in the application.

Listing of the Claims:

1. (Currently amended) A method of grading tubules in a first image of a histological slide, the method having the steps of:
 - a) providing a second image of first objects in the first image which are sufficiently large and of appropriate pixel value characteristics at boundaries to potentially be tubules,
 - b) providing a third image of second objects in the first image having pixel value characteristics of fat and holes within tubules,
 - c) combining data from the second and third images to identify selected second objects which are within first objects,
 - d) performing one or more of the following:
 - i) counting first objects in the first image which may potentially be tubules to provide a number of objects parameter-*NOB*,
 - ii) counting the first objects having selected second objects within them and likely to be tubules to provide a number of tubules parameter-*N*,
 - iii) determining the relative areas of selected second objects as proportions of respective first objects within which they are located to provide respective ratio parameters-*RATIO*,
 - iv) determining the total area of selected second objects as a proportion of total area of first objects within which they are located to provide a surface area ratio parameter-*SURF*,
 - v) determining a parameter $PERCENT = N/NOB$ expressing the number of tubules parameter as a proportion of the number of objects parameter, and
 - vi) counting the number of first objects containing at least medium sized holes to provide a tubules parameter-*T*, and
 - e) grading the first image's tubules on the basis of the one or more parameters as aforesaid with reference to parameter threshold values, and

- f) using the grading of the first image's tubules to provide a tubule score for use in diagnosis.
2. (Currently amended) A method according to Claim 1 wherein the step of providing a second image incorporates:
 - a) ~~thesholding~~ thresholding the first image to provide a fourth image retaining relatively darker image pixels and rejecting relatively lighter image pixels,
 - b) ~~proecessing~~ inverting the fourth image ~~by applying the following steps in suecession, the first being applied to the fourth image and each after the first being applied to the outcome of the respective immediately preceeding step: inversion, morphological dilation, median filtering, hole filling and morphological opening.~~ to provide inverted image data,
 - c) morphologically dilating the inverted image data to provide dilated image data,
 - d) median filtering the dilated image data to provide filtered image data,
 - e) hole filling the filtered image data to provide filled image data, and
 - f) morphologically opening the filled image data.
 3. (Previously presented) A method according to Claim 1 wherein the step of providing a third image comprises thresholding the first image to provide a binary fourth image in which relatively lighter image pixels have a different binary value to that of relatively darker image pixels.
 4. (Currently amended) A method according to Claim 1 wherein the step of combining data from the second and third images comprises:
 - a) ~~either~~ multiplying each pixel in the second image by ~~or ANDing them with a~~ respective corresponding ~~pixels~~ pixel located in ~~a like positions~~ position in the third image, ~~or~~
 - b) implementing a logical AND operation between each pixel in the second image and a respective pixel located in a like position in the third image.
 5. (Previously presented) A method according to Claim 1 wherein the step of grading the

first image's tubules employs parameter threshold values set to obtain a grading comparable with that obtainable by an appropriate medical expert.

6. (Canceled)

7. (Currently amended) ~~Computer-apparatus~~ Apparatus for grading tubules in a first image of a histological ~~slide~~ specimen, the apparatus incorporating a microscope and a camera for photographing a histopathological specimen to obtain digitised colour image data, and computer means for receiving the digitised colour image data, the computer means being programmed to:

- a) compute a second image of first objects in the first image which are sufficiently large and of appropriate pixel value characteristics at boundaries to potentially be tubules,
- b) compute a third image of second objects in the first image having pixel value characteristics of fat and holes within tubules,
- c) combine data from the second and third images to identify selected second objects which are within first objects,
- d) implement one or more of the following:
 - i) counting first objects in the first image which may potentially be tubules to provide a number of objects parameter-*NOB*,
 - ii) counting the first objects having selected second objects within them and likely to be tubules to provide a number of tubules parameter-*N*,
 - iii) determining the relative areas of selected second objects as proportions of respective first objects within which they are located to provide ratio parameters-*RATIO*,
 - iv) determining the total area of selected second objects as a proportion of total area of first objects within which they are located to provide a surface area ratio parameter-*SURF*,
 - v) determining a parameter $PERCENT = N/NOB$ expressing the number of tubules parameter as a proportion of the number of objects parameter, and
 - vi) counting the number of first objects containing at least medium sized holes

to provide a tubules parameter- T , and

- e) grade grading the first image's tubules on the basis of the one or more parameters as aforesaid with reference to parameter threshold values, and
- f) using the grading of the first image's tubules to provide a tubule score for use in diagnosis.

8. (Currently amended) ~~Computer-apparatus~~ Apparatus according to Claim 7 wherein the computer means is programmed to provide a second image by:

- a) thresholding the first image to provide a fourth image retaining relatively darker image pixels and rejecting relatively lighter image pixels,
- b) ~~processing~~ inverting the fourth image ~~by applying the following steps in succession, the first being applied to the fourth image and each after the first being applied to the outcome of the respective immediately preceding step: inversion, morphological dilation, median filtering, hole filling and morphological opening-~~ to provide inverted image data.
- c) morphologically dilating the inverted image data to provide dilated image data,
- d) median filtering the dilated image data to provide filtered image data,
- e) hole filling the filtered image data to provide filled image data, and
- f) morphologically opening the filled image data.

9. (Currently amended) ~~Computer-apparatus~~ Apparatus according to Claim 7 wherein the computer means is programmed to provide a third image by thresholding the first image to provide a binary fourth image in which relatively lighter image pixels have a different binary value to that of relatively darker image pixels.

10. (Currently amended) ~~Computer-apparatus~~ Apparatus according to Claim 7 wherein the computer means is programmed to combine data from the second and third images;

- a) either by multiplying each pixel in the second image by ~~or ANDing them with a~~ respective corresponding ~~pixels~~ pixel located in a like positions ~~position in~~ the third image, or
- b) by implementing a logical AND operation between each pixel in the second image

and a respective pixel located in a like position in the third image.

11. (Currently amended) ~~Computer apparatus~~ Apparatus according to Claim 7 wherein the computer means is programmed to grade the first image's tubules with parameter threshold values set to obtain a grading comparable with that obtainable by an appropriate medical expert.
12. (Canceled)
13. (Currently amended) A computer ~~program~~ software product comprising a carrier medium encoded with computer readable instructions and for use in grading tubules in a first image of a histological slide, the ~~program-containing~~ computer readable instructions being for controlling computer apparatus to:
 - a) compute a second image of first objects in the first image which are sufficiently large and of appropriate pixel value characteristics at boundaries to potentially be tubules,
 - b) compute a third image of second objects in the first image having pixel value characteristics of fat and holes within tubules,
 - c) combine data from the second and third images to identify selected second objects which are within first objects,
 - d) implement one or more of the following:
 - i) counting first objects in the first image which may potentially be tubules to provide a number of objects parameter-*NOB*,
 - ii) counting the first objects having selected second objects within them and likely to be tubules to provide a number of tubules parameter-*N*,
 - iii) determining the relative areas of selected second objects as proportions of respective first objects within which they are located to provide ratio parameters-*RATIO*,
 - iv) determining the total area of selected second objects as a proportion of total area of first objects within which they are located to provide a surface area ratio parameter-*SURF*,

- v) determining a parameter PERCENT = N/NOB expressing the number of tubules parameter as a proportion of the number of objects parameter, and
 - vi) counting the number of first objects containing at least medium sized holes to provide a tubules parameter- T , and
 - e) grade the first image's tubules on the basis of the one or more parameters as aforesaid with reference to parameter threshold values, and
 - f) use the grading of the first image's tubules to provide a tubule score for use in diagnosis.
14. (Currently amended) A computer ~~program~~ software product according to Claim 13 containing wherein the computer readable instructions provide for provision-of controlling computer apparatus to compute a second image by:
- a) ~~thesholding~~ thresholding the first image to provide a fourth image retaining relatively darker image pixels and rejecting relatively lighter image pixels,
 - b) ~~proecessing~~ inverting the fourth image ~~by applying the following steps in succession, the first being applied to the fourth image and each after the first being applied to the outcome of the respective immediately preceding step: inversion, morphological dilation, median filtering, hole filling and morphological opening, to provide inverted image data.~~
 - c) morphologically dilating the inverted image data to provide dilated image data,
 - d) median filtering the dilated image data to provide filtered image data,
 - e) hole filling the filtered image data to provide filled image data, and
 - f) morphologically opening the filled image data.
15. (Currently amended) A computer ~~program~~ software product according to Claim 13 containing ~~wherein the computer readable instructions provide for provision-of~~ controlling computer apparatus to compute a third image by thresholding the first image to provide a binary fourth image in which relatively lighter image pixels have a different binary value to that of relatively darker image pixels.
16. (Currently amended) A computer ~~program~~ software product according to Claim 13

~~containing wherein the computer readable instructions provide for combining provision of~~
~~controlling computer apparatus to combine~~ data from the second and third images;

- a) ~~either~~ by multiplying each pixel in the second image by ~~or ANDing them with a~~
respective corresponding ~~pixels~~ pixel located in ~~a like positions~~ position in the
third image, or
- b) by implementing a logical AND operation between each pixel in the second image
and a respective pixel located in a like position in the third image.

17. (Currently amended) A computer program software product according to Claim 13
~~containing wherein the computer readable instructions provide for grading combining~~
~~provision of controlling computer apparatus to grade~~ the first image's tubules with
parameter threshold values set to obtain a grading comparable with that obtainable by an
appropriate medical expert.

18. (Canceled)